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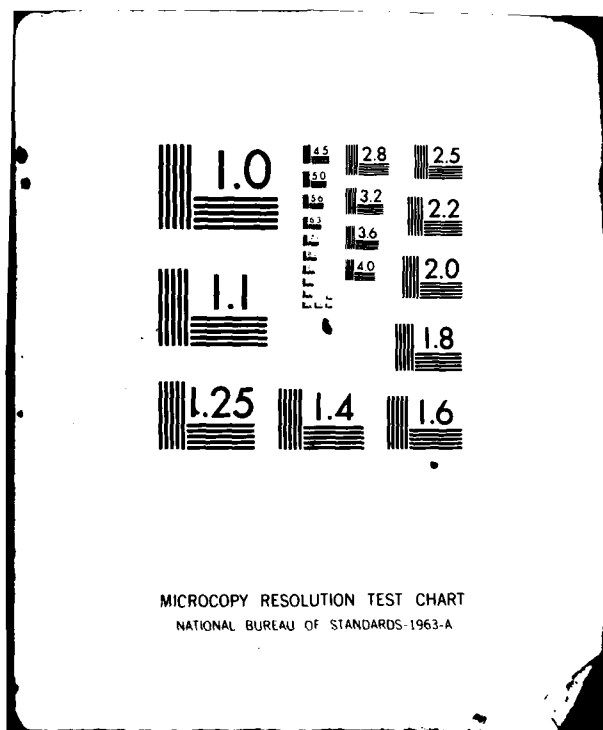
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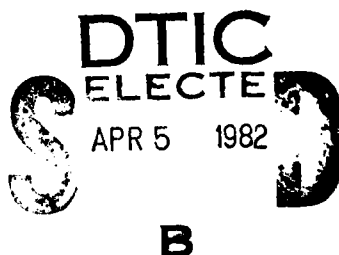# Bibliography of in-house and contract reports, supplement 10

Rosalinda P. Barrón

Margaret F. Fox

FEBRUARY 1982

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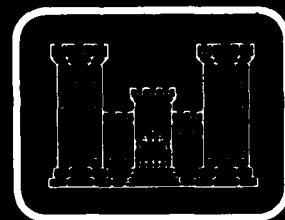ELECTE
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U.S. ARMY CORPS OF ENGINEERS
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FORT BELVOIR, VIRGINIA 22060

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REPORT DOCUMENTATION PAGE		READ INSTRUCTIONS BEFORE COMPLETING FORM
1. REPORT NUMBER ETL–0282	2. GOVT ACCESSION NO. AD-A113 006	3. RECIPIENT'S CATALOG NUMBER
4. TITLE (and Subtitle) BIBLIOGRAPHY OF IN–HOUSE AND CONTRACT REPORTS, SUPPLEMENT 10		5. TYPE OF REPORT & PERIOD COVERED Bibliography, Supplement 10 1 Jan 81 – 31 Dec 1981
		6. PERFORMING ORG. REPORT NUMBER
7. AUTHOR(s) Rosalinda P. Barrón Margaret F. Fox		8. CONTRACT OR GRANT NUMBER(s)
9. PERFORMING ORGANIZATION NAME AND ADDRESS U.S. Army Engineer Topographic Laboratories Fort Belvoir, Virginia 22060		10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS
11. CONTROLLING OFFICE NAME AND ADDRESS U.S. Army Engineer Topographic Laboratories Fort Belvoir, Virginia 22060		12. REPORT DATE February 1982
		13. NUMBER OF PAGES 31
14. MONITORING AGENCY NAME & ADDRESS(if different from Controlling Office)		15. SECURITY CLASS. (of this report) Unclassified
		15a. DECLASSIFICATION/DOWNGRADING SCHEDULE

16. DISTRIBUTION STATEMENT (of this Report)

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17. DISTRIBUTION STATEMENT (of the abstract entered in Block 20, if different from Report)

18. SUPPLEMENTARY NOTES

19. KEY WORDS (Continue on reverse side if necessary and identify by block number)

20. ABSTRACT (Continue on reverse side if necessary and identify by b' ;e:
This is Supplement 10 to the report titled "Bibliography ⸢ ᵢn-House and Contract Reports," (AD-877 653L), (Supplement 1, AD-890 066L), (Supplement 2, AD-905 548L), (Supplement 3, AD-B005 275L), (Supplement 4, AD-B010 642L), (Supplement 5, AD-B019 966L), (Supplement 6, AD-A055 468), (Supplement 7, AD-A068 744), (Supplement 8, AD-A084 111), (Supplement 9, AD-A099 803). It is a continuing bibliography of reports prepared by and for the U.S. Army Engineer Topographic Laboratories (USAETL), Fort Belvoir, Virginia. This bibliography includes reports published from 1 January 1981 through 31 December 1981.
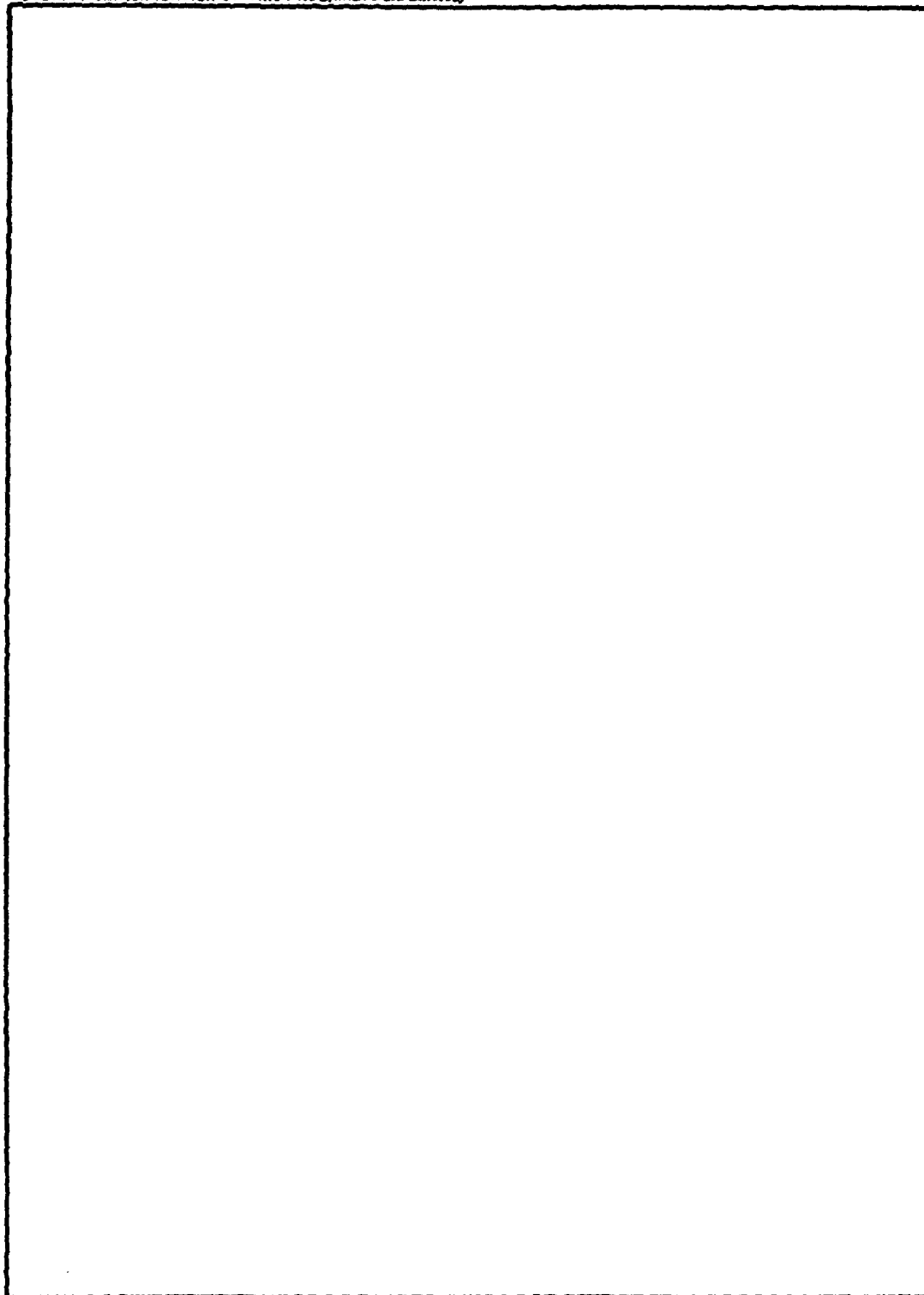
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PREFACE

This is Supplement 10 to the report titled "Bibliography of In-House and Contract Reports" (AD-877 653L), (Supplement 1, AD-890 066L), (Supplement 2, AD-905 548L), (Supplement 3, AD-B005 275L), (Supplement 4, AD-B010 6421), (Supplement 5, AD-B019 966L), (Supplement 6, AD-A055 468), (Supplement 7, AD-A068 744), (Supplement 8 AD-A084 111), (Supplement 9, AD-A099 803). It is a continuing bibliography of reports prepared by and for the U.S. Army Engineer Topographic Laboratories (USAETL), Fort Belvoir, VA. This bibliography includes reports that were published from 1 January 1981 through 31 December 1981.

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COL Edward K. Wintz, CE was Commander and Director, and Mr. Robert P. Macchia was Technical Director of the Engineer Topographic Laboratories during the report preparation.

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CONTENTS

ETL–0212   AD–A110 795

                            OPTICAL POWER SPECTRAL ANALYSIS
Leighty, Robert D.   FOR MACHINE–READABLE FACTOR MAPS
                                      December 1980

Keywords: Computer Simulation, Diffraction Pattern Sampling, Graphics Data
         Base, Map Storage and Retrieval, Terrain Information Systems.

A preliminary investigation of the application of Optical Power Spectral Analysis
(OPSA) approaches to machine-readable factor maps for terrain information sys-
tems is presented. The objective is to offer a more compact, simpler, and cheaper
data base storage and retrieval system that would be available by all digital tech-
nology. In the basic concept of the systems, OPSA is used to decode data from
reduced factor maps that have been encoded by spatial frequency and direction of
optical gratings.

ETL–0240   AD–A100 034

Stockman, George C.   THE DESIGN AND ANALYSIS OF A
Smith, Russell C.   HIGH–PRODUCTION MINI–COMPUTER SYSTEM FOR
Chang, I-Lok.   REGRIDDING DIGITAL TERRAIN ELEVATION MATRICES
                                      October 1980

L.N.K. Corporation   DAAK70-80-C-0022

Keywords: Digital Terrain Elevation Matrices, Transformation, Regridding.

This report studies a new algorithm for the regridding and transformation of Digital
Terrain Elevation Matrices. The new algorithm uses sequential accesses to mass
storage devices rather than the random methods used by the software system cur-
rently installed at the Defense Mapping Agency. Due to the simplicity of the new
algorithm, minicomputers can be used in place of a large mainframe computer.
Four potential minicomputer systems are examined. Benchmark test results are
given which show the feasibility of minicomputer use. Recommendations are made
concerning the minicomputer to select if the new algorithm is to be implemented.

A 12-month experimental study has been performed to investigate man-machine
interactive digital image processing techniques applied to the extraction of terrain
analysis data from aerial imagery. The study focuses primarily on the extraction
of vegetation data elements from digitized panchromatic photography, with a small
amount of attention given to thermal infrared and side-looking radar imagery. Of
thirteen vegetation data elements listed in the USAETL Terrain Analysis Pro-
cedural Guide for Vegetation, eight are addressed in varying degrees of depth in the
study. Interactive digital techniques are developed for vegetation/land cover bound-
ary extraction, and for the extraction of several forest related data elements such
as percent canopy closure, number of stems per hectare, tree crown diameter,
number of trees per hectare in each stem diameter class, and others. The extraction
techniques are developed using an existing general-purpose, interactive digital image
analysis system – the General Electric DIAL (Digital Image Analysis Laboratory).
Results are compared in two cases to those achieved via existing manual analysis
procedures. While the interactive digital extraction techniques exhibit a promising
potential, some technical problems remain. Further development, testing and eval-
uation are warranted using greater variety of test imagery, including radar and
thermal imagery.

4

ETL–0242   AD–B058 420L

Green, L. Dale   FEASIBILITY STUDY OF A QUICK
                                     RESPONSE MULTICOLOR PRINTER (QRMP)
                                          September 1980

Xerox Electro-Optical Systems   DAAK70-78-C-0135

Keywords: Color Image Processing, Color Xerography, Laser Reprography, Laser
              Scanning Xerography, Map Printer, Quick-Response Color Repro-
              duction.

The feasibility of a quick response multicolor printer for reproducing maps and
similar items in U.S. Army field operations was studied. The system is based on the
use of color xerography and laser scanning, which, in combination, appeared well-
suited to the fast response, low volume, moderate throughput objectives and to the
mobile van deployment needs underlying this project. Because of the requirement
for high image quality, precise color-to-color register, and a 24 by 30 inch sheet
format, register and sheet handling in the xerographic subsystem were determined
to be the principal technical issues to be resolved. The xerographic developer and
optical subsystems were also considered significant as feasibility questions. Analy-
tical and experimental investigations in these areas led to the conclusion that a
feasible system using available technologies can be developed to satisfy the stated
performance goals. The report provides technical data resulting from these investi-
gations as well as descriptions of system architecture and design concepts envisaged
for a map printer meeting the objectives of the program.

ETL–0243   AD–A091 928

Lott, R. W.
Stadelman, S. G.   STARAN IMAGE PROCESSING
Faiss, R. O.   October 1980

Goodyear Aerospace Corporation   DAAK70-79-C-0221

Keywords: Edge Enhancement, Parallel Processing, Relaxation Labeling.

This report discusses an image edge pixel enhancement technique that has been
implemented on the joint CDC–6400 STARAN computer facility at ETL. The
algorithm employs the interactive processes typical of relaxation labeling.

Grosso, P.F.   **PRE-PRODUCTION MODEL CARTOGRAPHIC**
Tarnowski, A.A.   **EBR SYSTEM**
                                        November 1980

Keywords: Automated Cartography, Cartographic EBR, Computer Output Graphics, Electron Beam Recorder (EBR), Raster Scan Translator, Symbol/Vector Generator.

The pre-production Model Cartographic EBR System installed at the Hydrographic/ Topographic Center in Washington, D.C. is a high speed, high resolution, recording system capable of plotting both lineal and raster data developed for the Defense Mapping Agency (DMA) to produce color separation film masters for maps, charts and high resolution satellite and aerial imagery from digital cartographic and image data on magnetic tape. The color separations are used to prepare press-ready printing plates for conventional multi-color printing presses for the printing of color charts and maps or to produce color composities of satellite imagery.

Lambird, Barbara A.
Lavine, David   **STUDY OF DIGITAL MATCHING**
Stockman, George C.   **OF DISSIMILAR IMAGES**
Hayes, Kenneth C.   *November 1980*
Kanal, Laveen N.

Keywords: Automated Cartography, Correlation, Dissimilar Images, Feature Extraction, Image Analysis, Image Matching, Pattern Recognition, Registration.

In this report, the registration of digital images from similar and dissimilar sensors is studied. The matching problem is divided into four subproblems: 1. detecting and extracting appropriate features; 2. determinating an approximate global registration; 3. determinating disparity for a subset of points in the image; and 4. determinating the global nonlinear transformation for the entire image.

Three classes of features and their detectors are considered; edge features, point features, and region features. Several registration methods are described, including a number of correlation procedures, the L.N.K. registration technique and its 3–d extension, and some region matching procedures. The registration techniques are briefly compared and contrasted. Their ability to handle the full rotation, scale and translation transformations, and their time and space requirements are considered. It is concluded that only two registration techniques are worthy of further investigation: the L.N.K. registration technique and a combined hierarchical-sequential correlation method using edge images.

The addendum to the Multi-Source Image Analysis contract consists of a reference set of simultaneously collected remote sensor data designed to evaluate terrain features. Airborne radar, thermal infrared and panchromatic imagery was collected by the Oregon Army National Guard at the Corvallis, Oregon, test site on 13 and 19 August 1980. Ground teams collected radiant and air temperatures, ground site photographs and soil samples from three traverses through the test area.

ETL-0250   AD-A100 037

AN EVALUATION OF REGISTERING IMAGE
Crombie, Michael A.   GRADIENTS WHEN MATCHING INFRARED
IMAGERY TO PANCHROMATIC IMAGERY
January 1981

Keywords: Base-Height Ratio, Correlation, Digital Pictures, Image Gradient, IR Imagery, Panchromatic Imagery, Signal Power.

A method for calculating corresponding points between infrared imagery and panchromatic imagery using the image gradients and two vector functions is evaluated. The results of the study demonstrate that the method is not satisfactory for mapping.

ETL-0251   AD-A100 036

NORTH-SEEKING GYROCOMPASS
FINAL TECHNICAL REPORT
October 1980

Sperry Gyroscope   DAAK70-78-C-0210

Keywords: North-Finding Module, North-Seeking Gyrocompass.

This report describes the north-seeking gyrocompass delivered for evaluation of the M113 armored vehicle. The system consists of a north-finding module attached to a vehicle mounted gimbal set and a separate control panel/battery charger. The gyrocompass supplies azimuth to an accuracy of 2 mils rms approximately 2 minutes after turn-on.

The first interim study report presents preliminary results of a study of the USAETL
Rapid Geodetic Survey System as to its capability for meeting performance goals
of mapping the gravity disturbance vector to 0.3 sec (RMS) for the deflection
components and 0.5 milligal (RMS) for the gravity anomaly on an interim basis
with 0.1 sec (RMS) for the deflection components and 0.2 milligal (RMS)
for the gravity anomaly as an ultimate goal.

The study determines the error characteristics of the existing system by laboratory
testing and introduces these results into a simulation program to validate perfor-
mance of the existing system. The effects of adjustment of specified system error
parameters can then be assessed on an individual basis along with the impact of real-
time software mechanization changes. Performance improvements are also obtain-
able with changes in operational procedures and also by an off-line Regional Ad-
justment Program (RAP) which combines the results of numerous traverses through
an area in an optimal fashion.

A number of changes to the system hardware to allow the performance goals to be
obtained are identified herein. Simulation results validating performance of the
current equipment along with necessary hardware and software changes to obtain
the interim and ultimate performance goals will be documented in the second
interim and final study report.

ETL–0253   AD–B062 053L

Adams, G.   **GRAVITY STUDY PROGRAM**
Borree, T.   **February 1981**

Honeywell, Inc.   DAAK70-80-C-0138

Keywords: Deflections of the Vertical, Gravity Anomaly, Gravity Measurement
              Improvement Study, Inertial Positioning Systems 2 (IPS–2).

This document is an interim report of a study to determine the changes required in
the IPS–2 to provide an improved precision gravity survey capability. An interim
development program has been recommended to correct the error sources identified
to date. Presently identified changes and those to be identified at the completion
of this study will affect the Velocity Measurement Unit, on-line software, opera-
tional procedures and/or post mission data processing and should result in a survey
system which will meet or exceed the 0.3 arc-second deflections and 0.5 milligals
anomaly and permit development of the long term goals.

ETL–0254   AD–A107 048

Wright, Janet S.   **TERRAIN ANALYSIS PROCEDURAL**
Vogel, Theodore C.   **GUIDE FOR SOIL. Report No. 6 in the**
Pearson, Alexander R.   **ETL Series on Guides for Army Terrain Analysts**
Messmore, Jeffrey A.   **February 1981**

Keywords: Factor Mapping, Military Geographic Information, Terrain Analysis,
              Thematic Mapping, Soil.

This report is one in a series of terrain analysis procedural guides being developed
in support of the Topographic Support System (TSS). It was written specifically
for a U.S. Army terrain analyst and presents the step-by-step methods needed for
extracting, reducing, and recording soil information on a factor overlay and sup-
porting data table.

ETL–0255   AD–A099 803

Barrón, Rosalinda P.

BIBLIOGRAPHY OF IN–HOUSE AND
CONTRACT REPORTS, SUPPLEMENT 9
February 1981

This is supplement 9 to the report titled "Bibliography of In-House and Contract Reports," (AD-877 653L), (Supplement 1, AD-890 066L), (Supplement 2, AD-905 548L), (Supplement 3, AD-B005 275L), (Supplement 4, AD-B010 642L), (Supplement 5, AD-B019 966L), (Supplement 6, AD-A055 468), (Supplement 7, AD-A068 744), (Supplement 8, AD-A084 111). It is a continuing bibliography of reports prepared by and for the U.S. Army Engineer Topographic Laboratories (USAETL), Fort Belvoir, Virginia. This bibliography includes reports published from 1 January 1980 through 31 December 1980.

ETL–0256   AD–A110 322

Moyer, Alan L.

ACOUSTO–OPTIC TECHNOLOGY FOR
TOPOGRAPHIC FEATURE EXTRACTION
AND IMAGE ANALYSIS
March 1981

Deft Laboratories, Inc.   DAAK70-79-C-0160

Keywords: Acousto-Optics, Algorithms, Feature Extraction, Image Processing.

This report contains all findings of the acousto-optic technology study for feature extraction conducted by Deft Laboratories Inc. for the U.S. Army Engineer Topographic Laboratories. The objective of this program was to develop, analyze and evaluate theoretical concepts and strategies for topographic feature extraction and image analysis using acousto-optic (A–O) technology.

A conclusion of this study was that A–O devices are potentially capable of implementing the feature extraction prefilter function very efficiently. Since the prefilter is the most computational intensive portion of the feature extraction process, this is a significant result. The best application of A–O devices is in the implementation of transform-based prefilter algorithms. Under this contract transform-based algorithms were identified and developed which are invariant to feature translation, rotation and scale. This invariance is highly desirable since it reduces the number of distinct feature signatures which must be processed by the decision processor.

Some preliminary experiments were conducted using the Fourier-based algorithms, test images and A–O device which was a Deft sensor. This combination of algorithms and sensor was able to distinguish between three test patterns which were presented in arbitrary orientation and scale. The success rate was 80 percent. In spite of these promising results, present Deft sensors are not capable of distinguishing realistic features in aerial photographs. New Deft sensors, presently under development, are described which will significantly improve the capability of this sensor in feature extraction applications.

The feasibility of adding a scanning/readout capability to Cartographic Electron Beam Recorder System was successfully demonstrated. An electron beam scanning mode of operation would allow cartographic line and gray shade data recorded on film to be rapidly digitized using a high resolution scanning electron beam. Further engineering programs are recommended to develop this capability.

12

The work reported was directed toward employing *a priori* knowledge in the auto-
matic analysis of aerial imagery. Major objectives of the research were directed
toward (1) map-guided registration, (2) verification of geographic data bases
extracted from imagery, (3) enrichment of geographic data bases, and (4) auto-
matic terrain feature extraction using multiple sources of knowledge and multi-
level decision making. The key component in all of the work was the matching of
existing iconic structure in a geographic data base (GDB) with detected image
structure.

By using iconic knowledge, the image interpretation paradigm becomes a three
step process. First, some primitive features of the imagery must be recognized with-
out any area-specific knowledge. Second, the imagery is aligned or registered with
the knowledge base by drawing correspondences between the image features and
their iconic analogues in the GDB. The matching is formalized by derivation of
a transformation which maps points (x, y) of the image to points (u, v) in GDB
coordinates. The final step of the process is the analysis of those parts of the image
which were not successfully interpreted in steps 1 and 2. This implies a top-
down search for image structures which correspond to features in the GDB.

Section 2 of the report treats primitive extraction. The emphasis is currently on
lineal, point, and region features only. A method for automatically inferring a
rotation and translation transforming image to map is given in Section 3. Classi-
fication of registered regions is discussed in Section 4. Verification of lineal GDB
features in gray-scale imagery is introduced in Section 5.

13

ETL–0259   AD–A101 422

                                    SHADED RELIEF IMAGES FOR
Taylor, Cyrus C.   CARTOGRAPHIC APPLICATIONS
                                          April 1981

Keywords: Atmospheric Haze, Gray-Shade Image, Image Formation, Light
            Scattering, Orthonormal Projection, Perspective Projection, Photo-
            metry, Polynomial Data Base, Relief Contours, Shaded Relief, Vari-
            able Sun Angle.

The computer generation of shaded relief images for cartographic applications is
analyzed. The geometric theory of image formation is presented in some detail,
and is used to motivate the discussion of the image simulation algorithms developed
at the U.S. Army Engineer Topographic Laboratories (ETL). Several algorithms
devised to address specific cartographic problems, such as variable sun angle, haze
simulation, and relief contour algorithms, are also discussed. The successful imple-
mentation of these algorithms is described. Appendixes summarizing details of the
theory are included, as are a Software User's Guide, sample images, and listings of
the ETL software.

ETL–0260   AD–A103 806

                                 STAR PATTERN RECOGNITION AND
Strikwerda, Thomas E.   SPACECRAFT ATTITUDE DETERMINATION
Junkins, John L.   May 1981

Virginia Polytechnic Institute & State University   DAAK70-78-C-0038

Keywords: Attitude, Navigation, Orientation, Pattern Recognition, Spacecraft,
            Stellar Camera.

A method for real-time on-board spacecraft attitude determination is presented.
The method is suitable for processing CCD or CID stellar camera and rate gyro
output to determine orientation to better than five arc seconds. The system is self-
calibrating; uncertain parameters such as interlock angles and gyro biases can be
included in the estimation algorithms. The system is implemented in a micro-
computer system which conclusively establishes that the system is compatible with
on-board computation constraints.

ETL-0261   AD-A102 893

Ehlen, Judy

THE IDENTIFICATION OF ROCK TYPES IN AN ARID REGION BY AIR PHOTO PATTERNS
June 1981

Air photo pattern criteria to identify rock types in an arid environment were evaluated for their usefulness and accuracy by stereo air photo analysis and field verification. The criteria came from published literature and from unpublished in-house research. In general, the unpublished criteria proved the most useful. New criteria to identify granitic rocks were successfully tested, and criteria for quartzite and andesitic rocks were identified. In addition, a basis was laid to develop criteria to identify metamorphic rocks by composition on aerial photography.

Sixteen lithologic units were identified and mapped on 1:100,000 scale stereoscopic panchromatic aerial photography. Lithologic predictions were based on detailed analyses of the photo pattern elements of landform, drainage, photo tone, and photo texture. Limited field checking showed that the lithologic predictions were generally correct. In addition, the boundaries of the lithologic units, not verified in the field, but determined from detailed photo analysis, compared favorably with boundaries shown on published geologic maps.

ETL-0262   AD-B060 540L

Adams, G.
Borree, T.
Hadfield, M.

Honeywell, Inc.

GRAVITY STUDY PROGRAM
June 1981

DAAK70-80-C-0138

15

This document is a final report of a study to determine the changes required in the IPS-2 to provide an improved precision gravity survey capability. An interim development program has been recommended to reduce the error sources identified to date. Identified changes during this study will affect the Velocity Measurement Unit, on-line software, operational procedures and/or post mission data processing and should result in a survey system which will meet or exceed the 0.3 arc-second deflections and 0.5 milligal anomaly and permit subsequent development of the long term goals.

ETL–0263   AD–A104 208

This report provides methods and procedures employed by U.S. Army Terrain Analysts to synthesize an LOC overlay from previously formatted military geographic information (MGI) thematic graphic data base (TGDB). Specific terrain factor overlays, such as Roads and Related Structures, Railroads, Airfields, etc. are taken one at a time and LOC-relevant data are traced onto a single frosted mylar overlay that, redrafted, becomes the final LOC document By combining specific terrain factor overlay data from MGI TGDB, the analyst produces a topographic product suitable for expedient reproduction by Army topographic field elements.

Grosso, P.F.   **RECORDING AND SCANNING ADVANCES**
Tarnowski, A.A.   **IN CARTOGRAPHIC EBR SYSTEMS**
                                          June 1981

Image Graphics, Inc.

Keywords: Automated Cartography, Cartographic EBR, Computer Graphics, Electron Beam Recorder (EBR), Micrographic EBR, Recorder, Scanner.

The experimental model cartographic EBR System developed for USAETL in 1977 was modified to include a number of advance hardware and software features: A Symbol/Vector Generator for plotting cartographic and names data; a Raster Scan Translator for recording continuous tone images; a scanning capability; a multiformal and size control: and other improvements.

                                ELECTROPHOTOGRAPHIC IMAGING
Tobin, Ephriam   **MATERIALS EVALUATION**
                                          June 1981

Perkin-Elmer Corporation

Keywords: Electrophotography, Electro-Static, Fusing, Image Quality, Photoconductive Film, Sensitometry, Surface Charge, Toner.

The recording capability of James River Graphics P5–003 and Eastman Kodak SO–101 were assessed after they were processed in a number of different toners. The evaluation covered the sensitometric performance and image quality of the materials in relation to their charge acceptance, dark decay, latent image-decay, continuous tone-sensitometry, resolution, granularity, edge-acutance, and digital recording capabilities. The results are discussed for each manufacturer's product and for the comparison of the products.

ETL-0267   AD-A109 144

Keywords: Conventional Astrogeodetic Methods, Deflections of the Vertical, Error Adjustments, Inertial Survey System.

In the experimental mobile inertial survey system, geodetic parameters are measured relative to an origin point. Certain errors build up along the survey course. Typically, these errors are adjusted and distributed both during and after completing each mission. During testing, the adjusted derived data are compared with "known" data that are determined by conventional "classical" surveys. In its research, ETL requires a more accurate adjustment of errors obtained from conventional methods.

The approach to the problem involved evaluating and analyzing the various error sources in the conventional data recalculation of certain data by new methods and developing a new statistical error treatment that applies not only to the objectives of this in-house research, but to the general application of inertial geodetic systems.

In this report, a new statistical error procedure has been developed to improve astrogeodetic positions that are useful in ETL's core program of RGSS tests and in any future tests of inertial systems.

ETL-0268   AD-A110 538

Earth Satellite Corporation   DAAK70-80-C-0016

Keywords: Agricultural Patterns, Digital Image Processing, Lake and Stream Delineation, LANDSAT, Multispectral Scanner, Return Beam Vidicon, Roads and Bridges, SEASAT, Shoreline Mapping, Swamp and Marsh Delineation, Urban Area Delineation.

This report describes the possible uses of higher resolution (25 meter) space-derived images for delineating and measuring surface features of interest in the Corps of Engineers Civil Works Program. Following a discussion of imaging sensors and computer processing methods, test evaluations are described in which LANDSAT multispectral scanner data and SEASAT SAR data were interpreted for surface features. The comparative advantages of the two data sources are discussed, and the complementary nature of LANDSAT MSS and SEASAT SAR images is displayed in the image analyses. Image examples are included for both background discussion and test site evaluation.

SCATTERING FROM A VEGETATION
Hevenor, Richard A.   LAYER WITH AN IRREGULAR
VEGETATION SOIL BOUNDARY
October 1981

A theoretical model is computed for the backscattering of electromagnetic waves from a layer of vegetation by using a first-order renormalization technique to determine volume scattering. The vegetation soil interface is assumed rough according to the tangent plane approximation and the scattering from this boundary is added incoherently to the volume scattering result. The mean wave in the vegetation is obtained using a bilocal approximation of the Dyson's equation. A free space dyadic Green's function is used, along with a correlation function of the dielectric fluctuations that are exponential in form and that also possess different correlation lengths ℓ_x, ℓ_y, and ℓ_z in the x, y, and z directions. Effective propagation constants are obtained for both horizontal and vertical polarization. The scattered wave is solved for by using a two-dimensional Fourier transform technique, and the boundary conditions at either end of the vegetation layer are matched. The far field backscatter coefficients are computed for both horizontal and vertical polarizations. The mean and variance of the dielectric fluctuations are calculated with the aid of Peake's model for the dielectric constant of vegetation. The theory is matched to experimental data taken from a corn field. The resulting values for the correlation parameters are then used to monitor the growth pattern of the corn field over a period of time. Comparisons between the theoretical and experimental results over this time period are shown. The theory is also matched to experimental data from spring and fall deciduous trees.

19

ETL-0271   AD-A109 139

Rohde, Frederick W.
A STUDY OF THE HUMAN VISUAL
SYSTEM IN SUPPORT OF AUTOMATED
FEATURE EXTRACTION
October 1981

An in-depth study of the anatomy and architecture of the visual system was con-
ducted. Signal processing along the visual pathway was analyzed. The functions of
the major conponents of the visual systems were studied and the number of neurons
determined. A comparison of the visual system with a computer was made. The
concept of a feature extraction system was developed and discussed.

ETL-0272   AD-A109 145

Norvelle, F. Raye
INTERACTIVE DIGITAL CORRELATION
TECHNIQUES FOR AUTOMATIC COMPILATION
OF ELEVATION DATA
October 1981

A program using digital correlation techniques has been implemented on the Digital
Image Analysis Laboratory (DIAL) to extract elevation data automatically from
stereoscopic pairs of digital images. The DIAL enables the operator to view on a
display unit the stereoscopic model and the computed match-point coordinates
in 3-D using anaglyphic techniques. The match points are presented as 3-D
profiles superimposed over the 3-D terrain model, and consequently, the operator
can observe the compilation process, detect errors as soon as they occur, and inter-
act with the process to prevent the accumulation of error or to tune the parameters
as conditions warrant. The program is described in terms of the hardware, the
algorithm, the operating procedures, and the examples of compiled areas.

ETL-0273   AD-B061 479L

Lambird, Barbara A.   INTERACTIVE KNOWLEDGE-BASED
Lavine, David   CARTOGRAPHIC FEATURE EXTRACTION
Kanal, Laveen N.   October 1981

The report presents the results of a technical study on a cartographic feature extraction system for the Digital Image Analysis Laboratory at the U.S. Army Engineer Topographic Laboratories. Included is a survey of the state of the art in cartographic feature detection and a design for a cartographic feature extraction system. The system has two parts – an image processing system that provides tentative segmentation and classification of the image.

The second part of the system is a rule-based production expert system that uses expert cartographic knowledge to detect the cartographic features based on the results of the first system. The systems are designed to be modular so that they are easy to implement, modify, update, and use.

ETL-0276   AD-B061 822L

THE DESIGN, MODIFICATION, FABRICATION AND
TEST OF A PROTOTYPE MINIATURIZED NORTH
REFERENCE UNIT (MINRU)
March 1979

This report summarizes the results of analysis, design and prototype development of a Miniature North Reference Unit (MINRU). Included among the efforts described are the hardward fabrication and acceptance testing of the unit. As the program progressed, hardware and software modifications were incorporated to satisfy the prescribed equipment error budgets and, ultimately, to achieve the performance within the constraints of the contract.

Lavine, David   ANALYSIS AND SIMULATION OF
Lambird, Barbara A.   DISCRETE DIGITAL IMAGE MATCHING
Kanal, Laveen N.   November 1981

L.N.K. Corporation   DACA76-81-C-0004

This report evaluates procedures for the approximate registration of digital images to maps and other images. It emphasizes point features and vectors derived from point features for image registration. Labeling and other means of adding definiteness to feature identification are promoted as ways to speed up registration. Clustering algorithms, distribution and type of features, hierarchical matching techniques, and other procedures are investigated with scene and map simulations.

22

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25

INDEXES

INDEXES (Continued)

CORPORATE AUTHORS

CONTRACT NUMBERS

PERSONAL AUTHORS

30

AD NUMBERS